UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/911,764	07/25/2001	Apostolis Papathanasiou	17390US01	5067

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ART UNIT	PAPER NUMBER
2193	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

	Application No.	Applicant(s)
Office Action Summary	09/911,764	PAPATHANASIOU, APOSTOLIS
	Examiner	Art Unit	
	Chat C. Do	2193	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on <u>24 October 2007</u>.

2a) ☒ This action is **FINAL.**   2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) <u>20-36</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) <u>20-36</u> is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on <u>25 July 2001</u> is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some *   c) ☐ None of:

        1. ☐ Certified copies of the priority documents have been received.

        2. ☐ Certified copies of the priority documents have been received in Application No. _____.

        3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1.   This communication is responsive to Amendment filed 10/24/2007.

2.   Claims 20-36 are pending in this application. Claim 20 is an independent claim. In Amendment, claims 1-19 are cancelled. This Office Action is made final.

Claim Rejections - 35 USC § 112

3.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4.   Claims 20-36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re claim 20, the limitation "adaptive linear system" is unclear how it is adaptive since there is nothing within the transformation is adapted. For examination purposes, the examiner disregards the term adaptive.

Thus, claims 21-36 are also rejected for being dependent on the rejected base claim 20.

Claim Rejections - 35 USC § 101

5.   35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

6.   Claims 20-36 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 20-36 cite a system for transforming complex number in accordance with a mathematical algorithm. In order for claims to be statutory, claims must either include a practical/physical application or a concrete, useful, and tangible result. However, claims 20-36 merely disclose steps/components for transforming complex number without further disclosing a practical/physical application or a useful and tangible result since the claims appear to preempt every substantial practical application of the idea embodied by the claim and there is no cited limitation in the claims that breathes sufficient life and meaning into the preamble so as to limit it to a particular practical application rather than being so broad and sweeping as to cover every substantial practical application of the idea embodied therein. Therefore, claims 20-36 are directed to non-statutory subject matter.

Claim Rejections - 35 USC § 102

7.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8.   Claims 20-24 and 27-31 are rejected under 35 U.S.C. 102(b) as being anticipated by

Martin ("Unitary ESPRIT: How to Obtain Increased Estimation Accuracy with a Reduced

Computational Burden").

Re claim 20, Martin discloses an adaptive linear system (e.g. page 1233 left

column first paragraph) to adapt a set of complex valued observations having adaptation

parameters with complex-valued elements (e.g. abstract page 1232), comprising: a

complex Least Square Solver (LESS) (e.g. introduction section pages 1232-1233),

having: means for transforming adaptation observations from a complex arithmetic to

two sets of real number arithmetic observations by means of binary orthogonalization

transformation (BOT) (e.g. page 1232 right column lines 3-17); means for computing

with two real number LESS two sets of real number arithmetic adaptation parameters

(e.g. right column in page 1233 wherein a complex number/matrix is converted to two

real numbers/matrices corresponding to even and odd order of the complex

number/matrix); and means for transforming after said computing with LESS said two

sets of real adaptation parameters to a set of complex number arithmetic adaptation

parameters using an inverse binary orthogonalization transform (IBOT) (e.g. as reversed

processed of BOT, page 1232 right column lines first paragraph; right column lines 8-10

page 1232).

Re claim 21, Martin further discloses means of computing of said two sets of real

number LESS are applied in parallel (e.g. equation 7 wherein matrix T(G) is operated in

parallel manner and page 1232 last three lines of right column).

Re claim 22, Martin further discloses means of computing of said two sets of real

number LESS are applied in series (e.g. equation 7 wherein matrix T(G) is operated in

series manner).

Re claim 23, Martin further discloses the LESS represents a Recursive Least

Squares algorithm (RLS) (e.g. section D in pages 1237-1238).

Re claim 24, Martin further discloses the LESS represents a Least Mean Squares

(LMS) algorithm (e.g. section D in page 1237-1238).

Re claim 27, Martin further discloses LESS is QR Decomposition (QRD) (e.g.

right column page 1232 line 5 from bottom).

Re claim 28, Martin further discloses the RLS is computed by a systolic array

(e.g. right column page 1232 lines 1-4 from bottom).

Re claim 29, Martin further discloses the LESS represents the group consisting of

a Block Matched Filter Estimator (BMFE), a Block Zero Forcing Estimator (BZFE), and

a Block Minimum Mean Square Error Estimator (BMMSEE) (e.g. inherently).

Re claim 30, Martin further discloses the group is computed through the group

consisting of a Cholesky decomposition and a QR Decomposition (QRD) (e.g. right

column page 1232 line 5 from bottom).

Re claim 31, it has similar limitations cited in claim 20. Thus, claim 31 is also

rejected under the same rationale as cited in the rejection of rejected claim 20.

Claim Rejections - 35 USC § 103

9.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

10.   Claims 25-26 and 32-36 are rejected under 35 U.S.C. 103(a) as being obvious over

Martin et al. ("Unitary ESPRIT: How to Obtain Increased Estimation Accuracy with a Reduced

Computational Burden").

        Re claims 25-26, Martin et al. do not disclose the LESS is a Householder

transformation nor a Cholesky decomposition.

        However, the examiner takes an office notice that the Householder transformation

and Cholesky decomposition are two well-known mathematically algorithms for

decomposition factorization matrices.

        Therefore, it would have been obvious to a person having ordinary skill in the art

at the time the invention is made to use the Householder transformation and Cholesky

decomposition for computing in Martin et al.'s invention because they would enable to

efficiently process the large matrices.

        Re claims 32-36, Martin et al. do not disclose linear system is applied for the

group consisting of temporal, spatial, joint temporal, spatial channel estimation, spatial

channel equalization, carrier frequency estimation, Direction of Arrival (DOA)

estimation, and joint carrier frequency and DOA estimation, an adaptive filter, and

channel estimation, system parameter estimation, channel equalization, recursive

updating of output parameters, non-recursive updating of output parameters, and system

identification.

However, computation of the temporal, spatial, joint temporal, spatial channel

estimation, spatial channel equalization, carrier frequency estimation, Direction of

Arrival (DOA) estimation, and joint carrier frequency and DOA estimation, an adaptive

filter, and channel estimation, system parameter estimation, channel equalization,

recursive updating of output parameters, non-recursive updating of output parameters,

and system identification are known in the art to use an adaptive algorithm.

Therefore, it would have been obvious applications to a person having ordinary

skill in the art at the time the invention is made to apply the above algorithm to the

temporal, spatial, joint temporal, spatial channel estimation, spatial channel equalization,

carrier frequency estimation, Direction of Arrival (DOA) estimation, and joint carrier

frequency and DOA estimation, an adaptive filter, and channel estimation, system

parameter estimation, channel equalization, recursive updating of output parameters, non-

recursive updating of output parameters, and system identification application because it

would enable to reduce the complexity of computing the estimated signals.

Response to Arguments

11.   Applicant's arguments filed 10/24/2007 have been fully considered but they are not

persuasive.

        a.   The applicant argues in page 6 fifth paragraph for claims rejected under 35 U.S.C.

        101 that the claims are statutory since they are directed to an adaptive linear system.

The examiner respectfully submits that the claims do not clearly define an "adaptive" linear system. How it is being adaptive is unclear in the claim. Even though, it is an adaptive linear system, it is still rejected under 35 U.S.C. 101 since it does not disclose or address any practical application of the transformation which would preemptive every substantial practical applications. Basically from the claims, the claims just disclose a transformation as converter for converting a complex number to a set of real number for mathematical manipulation. This is just abstract ideal.

b.   The applicant argues in page 6 last paragraph for claims rejected under 35 U.S.C. 102(b) that the cited reference fails to disclose the two real LESS as cited in the claimed invention.

The examiner respectfully submits that the two real LESS is either clearly or expressively disclosed in the technical paper by Martin, particularly right column page 1232 and right column page 1233, wherein the algorithm is used to convert a complex matrix into two real matrices for processing. Further more in page 1233, the two real LESS matrices can be the even and odd real matrices of the original complex matrix.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing

date of this final action.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Chat C. Do whose telephone number is (571) 272-3721. The

examiner can normally be reached on M => F from 7:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Meng-Ai An can be reached on (571) 272-3756. The fax phone number for the

organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chat C. Do
Examiner
Art Unit 2193

November 24, 2007